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Soybean Aphid Egg Hatch Starting in Northern Iowa

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Soybean Aphid Egg Hatch Starting in Northern Iowa

Abstract

Iowa's most significant soybean insect pest, soybean aphid, has host-alternating biology. This species has multiple, overlapping generations on soybean in the summer and moves to buckthorn in the winter. Fall migration to buckthorn is based on senescing soybean, and decreasing temperatures and photoperiod. For the majority of the year, soybean aphids are cold-hardy eggs near buckthorn buds (Photo 1). As spring temperatures warm up, soybean aphid eggs hatch and produce a few generations on buckthorn before moving to soybean (Photo 2). Tilmon et al. (2011) goes into more detail about the life cycle and biology of soybean aphid.

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What's behind Iowa's 2019 soybean yield gaps?

May 2, 2019

Over the last five years, the North Central region of the U.S. has been responsible for 82 percent of the nation's soybean harvest. Due to the region's importance to soybean production for its various uses in feed, biodiesel and other widely used products, the North Central Soybean Research Program (NCSRP), through funding from the Soybean Checkoff Program, has sponsored on-farm surveys to farmers in the region to evaluate trends in farming practices and management systems. These responses have helped surveyors develop correlations between total annual yield numbers and particular crop management practices.

Beginning in 2016, the “Benchmarking Soybean Production Systems in the North Central US” project analyzed useable data from 8,000 fields representing 500,000 acres. Project leaders at the University of Nebraska-Lincoln and the University of Wisconsin compiled the survey data from state partners in the region, including Iowa. The report broke down the data by state in the region, illustrating the variables that contributed to yield gaps within that state.

In Iowa, project leaders concluded that soybean yield gaps were primarily impacted by planting dates and the application of foliar fungicides/insecticides. To evaluate and develop correlations between management practices and total yields, input was collected from 1,327 fields in the state, from 2014-2017.

Methodology

To control for outliers and differing soil conditions and weather patterns, surveyors divided the state into seven regions called Technology Extrapolation Domains (TEDs)

based on soil, annual precipitation and temperature. For every TED, data were broken into two groups: one representing statistically higher yields, and the other statistically lower yields.

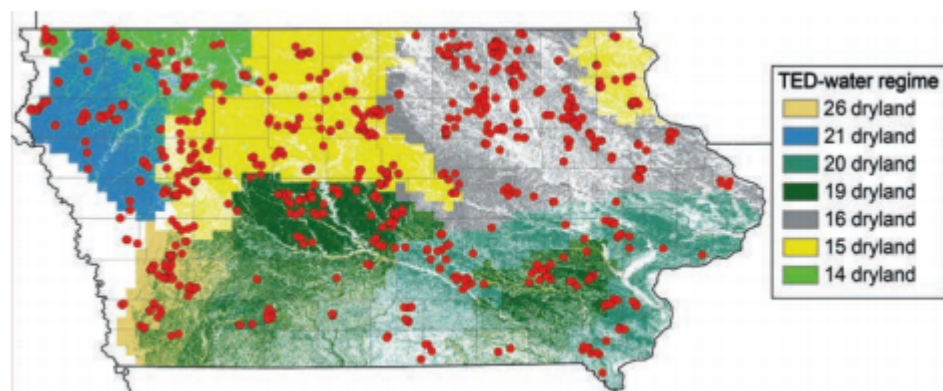


Figure 1. The Technology Extrapolation Domains (TEDs) in Iowa. The colors in the table represent the seven different TEDs, which correspond to the colors on the map. The numbers next to each color in the table indicate the label of the TED zone.

Iowa TEDs

According to the data, 85 percent of soybean fields (6 out of 7 TEDs) in the state with significantly higher yield numbers (bushels per acre) were planted earlier in the season than those with statistically lower yields, and received a foliar fungicide/insecticide application. Variables such as drainage, tillage, and row spacing (between 15-30 inches) resulted in higher yields only in some TEDs (between 1-4 out of 7). An interesting finding in the report was high yielding fields were not associated with higher seeding rates, which means farmers have an opportunity to fine tune seeding rates for a potential profit increase.

		-----TED-----													
		14D		15D		16D		19D		20D		21D		26D	
Management Practices	Yield category	HY	LY	HY	LY	HY	LY	HY	LY	HY	LY	HY	LY	HY	LY
	Average bu/A	68	54	68	48	69	49	72	55	75	52	73	56	73	58
	Planting date			May 15	May 19	May 13	May 17	May 11	May 21	May 9	May 20			May 10	May 20
	Seeding rate (x1000 seeds ac ⁻¹)	144	147	149	154					149	168				
	Row spacing														
	% Fields with artificial drainage											92	67		
	% Fields with tillage			74	61	53	40			73	48			38	11
	% Fields with foliar insecticide and/or fungicide	96	86	57	30	54	35			67	28	74	35	63	14

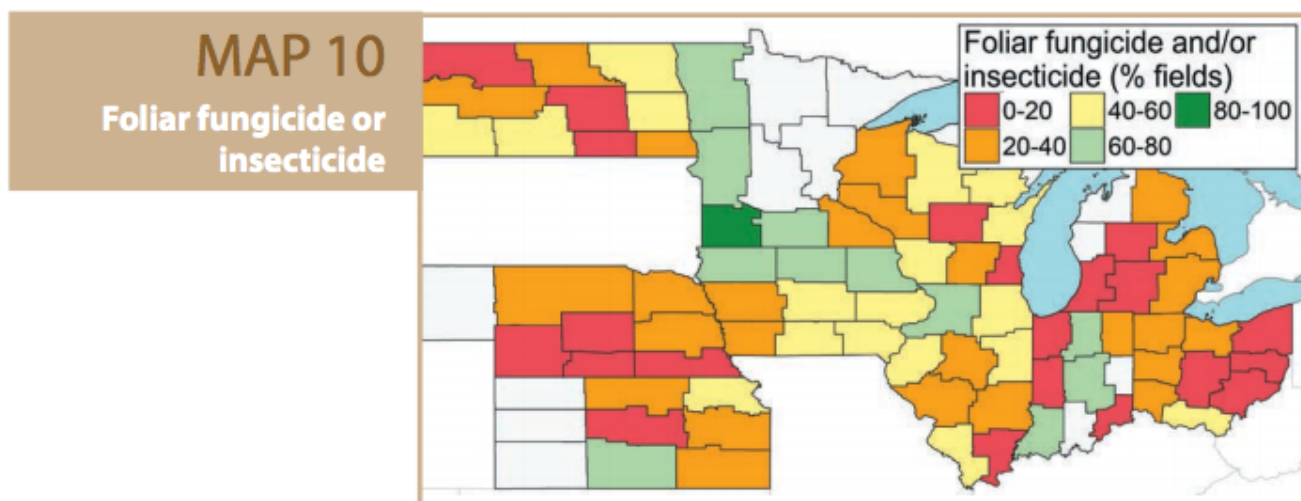
Figure 2. This table lists the variables that the surveyors evaluated for their respective impact on total yield. Each TED number's location can be found on Figure 1. In Iowa, earlier planting date and higher percentages of fields sprayed with foliar pesticides correlated with higher yields.

While soybean planting date was one of the top variables in the yield gap, the survey data did not suggest that planting soybean before April 20 definitively meant higher yields, rather that higher yields were correlated with earlier planting dates. The data gathered from the survey indicates soybean planting delayed into mid- to late May resulted in lower yield potential. According to the chart, five out of seven TEDs saw planting date as a variable impacting total yield. In TEDs 26D and 19D, the difference of 20 bushels per acre was the result of planting 10 or fewer days closer to mid-May. For TED 20D, which experienced a similar yield difference between the highest and lowest yields as the aforementioned zones, the planting window stretched 11 days. For TEDs 15D and 16D, the planting dates began and ended closer to mid-May than the other zones' windows, indicating that the closer to mid-May producers planted, the greater the potential for lost yield.

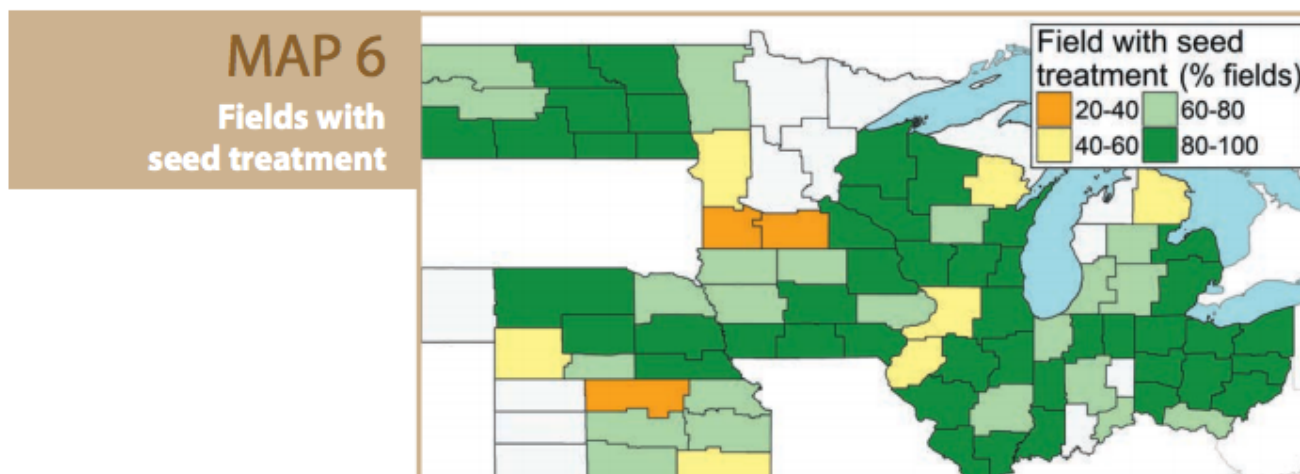
According to Figure 2, while planting date significantly impacted yield potential, the application of a foliar fungicide/insecticide helped farmers to realize yield potential present at the corresponding planting date. Given that the yield potential had been set by planting date, achieving that potential was influenced by foliar pesticides.

Trends in agricultural districts

In Map 10 of North Central states broken down in to states' respective agronomic regions, application of foliar fungicide/insecticide to fields varied, including Iowa.

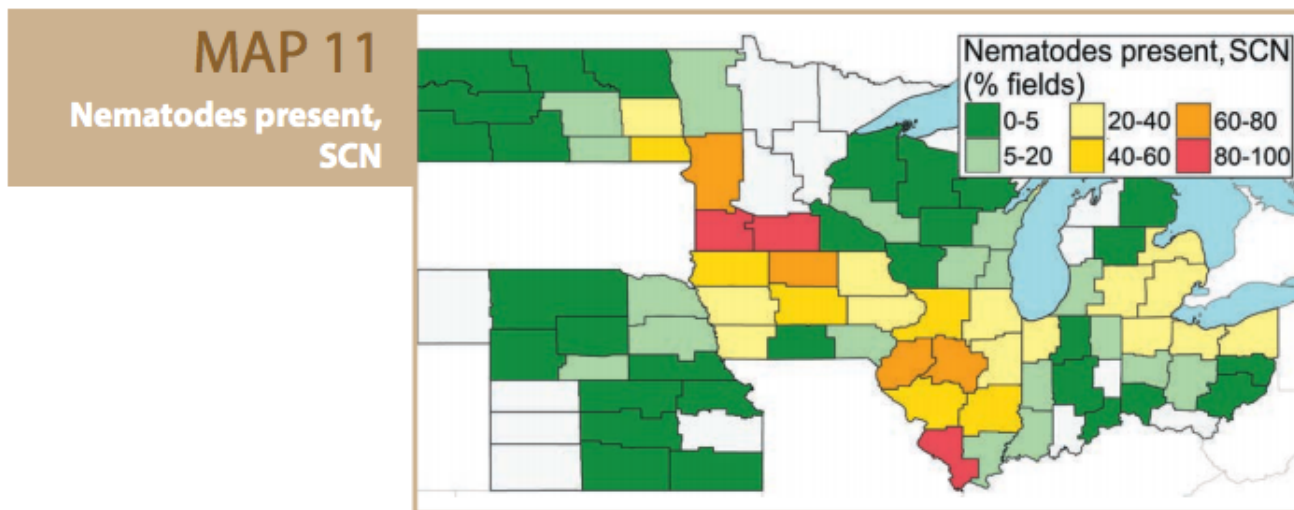


According to Map 6, over 60 percent of all recorded soybean fields received a seed treatment. As one can infer, use of foliar fungicides/insecticide was more variant than use of seed treatments, which could explain why foliar pesticides weighed more heavily on total yield outcomes. The varying application rates by agronomic region could be due to multiple factors, including: incidence of pest and timing of pest expression and/or arrival, economic thresholds, weather and the effect of seed treatments.



Soybean Cyst Nematode's (SCN) impact on yield

One last interesting component of the survey was the impact of soybean cyst nematode (SCN) on total soybean yield. The final report states, “In the case of SCN incidence, average values were estimated based only on those fields in which farmers knew if there was SCN information or not, which means that the figures may be higher because many farmers did not test their fields for SCN.”



Application

As planters start to come out this spring, knowing these data can help design an IPM program providing economic benefits, pest control and that supports a successful, long-

term strategy. It should be expressed again that this data only shows correlations between crop management practices and yield amounts, and that the correlations might not be indicative of all yield outcomes. Further, the report doesn't advocate that farmers *should* implement these practices that result in higher yields, rather the report only shows the results of past behaviors.

Nevertheless, both Iowa State University ([corn](#), [soybean](#)) and the [Crop Protection Network](#) have made available their 2019 fungicide efficacy tables, which should be consulted before making a fungicide decision, should a farmer choose to do so. Iowa State has data showing there are known isolates of the frogeye leaf spot, *Cercospora sojina*, and Septoria brown spot, *Septoria glycines*, pathogens that are resistant to quinone outside inhibitor (QoI, strobilurin) fungicides. Likewise, studies conducted in the Midwest show that soybean aphid [is showing resistance to pyrethroid insecticides](#).

When it comes to SCN, it's important that farmers test their fields regularly. SCN is the single most damaging pest affecting soybean in the U.S. According to soil sampling by the Iowa Soybean Association, SCN has been confirmed in all 99 counties, with 75-80 percent of fields having some level of infestation. As the report noted, average values for SCN were estimated based only on those fields in which farmers knew if there was SCN information or not. Often there are no obvious aboveground symptoms of damage caused by SCN. Since there are rarely aboveground symptoms, many infestations go undiscovered for numerous years. On average, SCN causes producers in Iowa currently more than 50 million bushels a year. The Iowa State Plant and Insect Diagnostic Clinic (PIDC) offers a [soil sampling service for farmers](#). In addition to directly harming soybean plants, SCN also leaves soybean plants more susceptible to certain soil borne pathogens including *Rhizoctonia* and *Fusarium*.

Diversifying your pest management tools, such as seed treatments, crop rotation and pesticide application can help against the development of pest resistance. As always, scouting is the first step in pest management. Only through correctly identifying pathogens and insects can we make smarter and more economical decisions.

****Project Principle Investigators Patricio Grassini and Shawn P. Conley, of the University of Nebraska-Lincoln and the University of Wisconsin-Madison, respectively, contributed to this article. Thank you to the Soybean Checkoff Program for funding this valuable research through the North Central Soybean Research Program.***

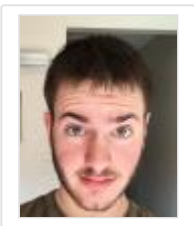
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Crop:

Soybean

Tags: 2019 yield gap Iowa soybean yield gap North Central Soybean Yield Gap Benchmarking Soybean Production Systems in the North Central US

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